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Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

MAR 3 1997

Federal Communications Commission  
Office of Secretary

In the Matter of	)	
	)	
Amendment of the Commission's Rules to	)	ET Docket No. 96-102
Provide for Operation of Unlicensed NII	)	RM-8648
Devices in the 5 GHz Frequency Range	)	RM-8653

**PETITION FOR RECONSIDERATION**

Apple Computer, Inc. ("Apple") hereby respectfully requests that the Federal Communications Commission ("Commission" or "FCC") reconsider in three respects its recent Report and Order in the above-referenced proceeding.<sup>1</sup> First, Apple requests that the Commission expedite its consideration of whether to permit the use of more highly directional antennas for transmitters using the uppermost portion (5725-5825 MHz) of the Unlicensed National Information Infrastructure ("U-NII") band.<sup>2</sup> Second, Apple requests that the Commission amend the antenna directionality rules for the middle U-NII sub-band (5250-5350 MHz). Finally, Apple requests that the Commission amend the peak power spectral density ("PSD") limit for U-NII devices operating in the 5250-5350 MHz sub-band to 125 mW/MHz and amend the PSD limit for U-NII devices operating

<sup>1</sup> Amendment of the Commission's Rules to Provide for Operation of Unlicensed NII Devices in the 5 GHz Frequency Range, Report and Order, ET Docket No. 96-102, FCC 97-5 (released Jan. 9, 1997).

<sup>2</sup> On February 13, 1997, Apple submitted a letter to the Office of Engineering and Technology in which it urged the Commission not to defer its consideration of whether to permit the use of more highly directional antennas by U-NII transmitters using the 5725-5825 MHz band, but rather to consider this question as part of the instant proceeding and, at most, to request additional comment on the narrow question of whether the U-NII rules should be changed to reflect any changes in the spread spectrum rules. In order to avoid any claim that Apple's letter did not provide an adequate basis for the Commission to expedite its consideration of the use of highly directional transmit antennas by U-NII devices, and in the event that the Commission would prefer to address this issue as part of its reconsideration process rather than through a request for additional comments, Apple is including this request in its Petition for Reconsideration.

in the 5725-5825 MHz sub-band to 1 Watt in 2 MHz, rather than 1 Watt in 20 MHz.<sup>3</sup>

I. THE COMMISSION SHOULD EXPEDITE ITS CONSIDERATION OF WHETHER TO PERMIT U-NII DEVICES OPERATING IN THE 5725-5825 MHZ BAND TO USE MORE HIGHLY DIRECTIONAL TRANSMIT ANTENNAS.

Apple is one of the original proponents of unlicensed U-NII devices.<sup>4</sup> In addition to supporting generally the need for a high bandwidth unlicensed band in the 5 GHz range, Apple has been one of the principal advocates for the creation of unlicensed longer-distance “community networks.” As such, Apple was pleased that the Commission has come to recognize the importance of community networks in helping to meet the communications needs of educational institutions, libraries, health care providers, and others,<sup>5</sup> and that the Report and Order therefore adopted power limits and other rules that will make possible at least a limited community networking function in a portion of the U-NII band.<sup>6</sup>

In the Report and Order, the Commission recognized that it may be appropriate to further accommodate community networking by permitting U-NII devices operating in the 5725-5825 MHz band to use more highly directional antennas than are permitted under the current rules.<sup>7</sup> The power and antenna directionality rules adopted for U-NII devices operating in the 5725-5825 MHz band are identical to those that currently apply to spread spectrum Part 15 devices operating in the 5725-5850 MHz band.<sup>8</sup> In a separate proceeding, however, the Commission is considering whether to permit 5 GHz spread spectrum devices to use more highly directional transmit antennas.<sup>9</sup> As a result,

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<sup>3</sup> The Report and Order permits U-NII devices operating in the upper band to employ a peak PSD of 50 mW/MHz for an antenna gain of 6 dBi. Report and Order at ¶ 49. This corresponds to a PSD of 1 Watt in 20 MHz for an antenna gain of 6 dBi.

<sup>4</sup> Id. at ¶ 2.

<sup>5</sup> Id. at ¶ 18.

<sup>6</sup> Id. at ¶ 46.

<sup>7</sup> Id. at ¶ 47.

<sup>8</sup> Id. at ¶ 46. While the power and directionality rules are the same for U-NII and spread spectrum systems, U-NII devices are subject to much stricter PSD limits than are spread spectrum systems operating under 47 C.F.R. § 15.247. As discussed below, this limits the capabilities of U-NII devices *vis-a-vis* spread spectrum devices, and this disparity should be addressed by the Commission.

<sup>9</sup> Id. at ¶ 47 (citing ET Docket No. 96-8).

the Commission stated in the Report and Order that, if it decides in the other proceeding to permit the use of higher gain directional transmitting antennas for spread spectrum operations, it may consider in a separate rulemaking similar action for U-NII devices operating in the 5725-5825 MHz band.

Apple urges the Commission to consider in tandem, rather than seriatim, whether to increase the permitted antenna gain for both spread spectrum and U-NII systems operating in the 5725-5825 MHz band. Were the Commission to proceed as discussed in the Report and Order — first deciding whether to increase antenna gain for spread spectrum systems, and only then deciding whether to increase antenna gain for U-NII systems — its process would delay unnecessarily the potential introduction of beneficial longer range U-NII devices.

There are compelling policy reasons why the Commission should consider simultaneously the permissible antenna gain for spread spectrum and 5725-5825 MHz U-NII devices. Indeed, Apple first noted the interplay between the spread spectrum and U-NII proceedings seven months ago when it filed comments in ET Docket No. 96-9.

First, the core question of whether the use of more highly directional antennas will increase — or instead reduce — objectionable interference to others sharing the 5725-5850 MHz band can best be addressed if all relevant attributes of both spread spectrum and U-NII devices are “on the table” at the same time. Second, several commenters in this proceeding — including WINForum, Microsoft, and Motorola — already have addressed why the Commission should adopt and maintain parallel rules for spread spectrum and U-NII devices operating in the 5725-5825 MHz band. Third, the record in this proceeding already contains an extensive discussion of the need for longer distance community networks, as well as of the potential for interference between U-NII systems that employ directional antennas and other users of the 5725-5825 MHz band.

As a result of the above, there is no need for the Commission to start a new proceeding or to defer, until after a decision has been issued in the spread spectrum proceeding, its consideration of whether to permit higher gain antennas for U-NII devices operating in the 5725-5825 MHz band. Either such approach would force parties to duplicate much of the record that already exists

in this proceeding, thereby wasting the Commission's resources and those of the public, as well as effectively guarantee that the introduction of longer range U-NII devices would be delayed by a year or more.

**II. THE COMMISSION ALSO PROMPTLY SHOULD CONSIDER WHETHER TO PERMIT THE USE OF MORE HIGHLY DIRECTIONAL TRANSMIT ANTENNAS IN THE 5250-5350 MHz BAND.**

The arguments supporting the use of directional transmit antennas are as applicable to the middle U-NII band (5250-5350 MHz) as they are to the upper U-NII band (5725-5825 MHz). The one watt power limit for the middle band, by itself, is adequate to permit the creation of longer-reach community networks. The current rules, however, penalize directionality beyond that of a 6 dBi (essentially omnidirectional) antenna and, as a result, will frustrate the ability of manufacturers and users seeking to create community networks within this sub-band.

As Apple and others previously have discussed in this proceeding, the Commission should encourage, rather than penalize, the use of more highly directional transmit antennas. To do so, the Commission should amend the antenna directionality rules for 5250-5350 MHz U-NII devices at the same time that it amends the antenna directionality rules for 5725-5825 MHz U-NII devices and spread spectrum devices. Specifically, the Commission should replace its current rule (which requires a dB-for-dB back-off in transmit power for antennas with a directional gain of more than 6 dBi) with a rule requiring a back-off of 1 dB in power for each 3 dB of antenna gain in excess of 6 dBi. Alternately, the Commission could apply the same directionality rules to the middle U-NII band that it adopts for the upper U-NII band and for spread spectrum devices.

**III. THE COMMISSION SHOULD AMEND THE PSD LIMITS APPLICABLE TO THE MIDDLE AND UPPER U-NII SUB-BANDS BY BASING THE PSD LIMITS ON A 2 MHz RATHER THAN A 20 MHz BANDWIDTH.**

In the Report and Order, the Commission imposed peak PSD limits for each of the U-NII band segments. In the middle U-NII band, a limit of 12.5

mW/MHz for an antenna gain of 6 dBi was adopted; for the upper U-NII band, a limit of 50 mW/MHz for an antenna gain of 6 dBi was adopted.<sup>10</sup>

The Commission adopted its U-NII PSD rules in large part to encourage the use of the U-NII bands for the broadband operations for which they are intended.<sup>11</sup> While Apple recognizes the role the U-NII band will play in making available very high speed, short range communications, the rules governing the band should not be so strict that they make it impossible for U-NII devices also to satisfy the longer distance, somewhat lower bandwidth needs of those who will rely on community networks.

At this stage in the deployment of “wideband” services, an ISDN data rate (56 kbps) is a luxury for many, and a T1 (1.544 Mbps) unlicensed capability represents a major advance over the data rates that currently are available over wired networks only at very high monthly costs — if at all — to most individuals and organizations. Community networks must be able to provide T1 data rates over reasonable distances if they are to meet the immediate and near-term needs of many users, including rural schools, hospitals, and libraries. As a result, the Commission should amend its PSD rules so as to make it more feasible for U-NII links in the middle and upper portions of the U-NII band to support T1 and faster data rates over distances exceeding “several kilometers.”<sup>12</sup>

Power density is, of course, a major determinant of the distances that can be achieved for line-of-sight paths. Under the spread spectrum rules, designers are free to respond to market forces, making tradeoffs between distance (as represented by the signal-to-noise ratio produced as a result of a PSD) and data rate (or bandwidth). Under the U-NII rules, these tradeoffs are not permitted: distance is essentially fixed, independent of bandwidth, because manufacturers must reduce their power (and hence achievable distance) in tandem with any reduction in bandwidth. This disparity not only violates the goal of functional

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<sup>10</sup> *Id.* at ¶ 49.

<sup>11</sup> *Id.* U-NII devices are defined as providing “wideband, high data rate” communications. 47 C.F.R. § 15.403 (a).

<sup>12</sup> *See id.* at ¶ 46 (stating that the power limits adopted for U-NII devices operating in the upper band will provide community networks with a typical range of several kilometers, and that longer-range communications could be possible in rural and other areas with a low interference environment).

and technological parity for U-NII devices *vis-a-vis* other unlicensed devices operating in the 5 GHz range.<sup>13</sup> In addition — and even more importantly — it will make it more difficult for U-NII devices to provide the bandwidths, T1 and up, at the distances that community networks will require.

Accordingly, the Commission should modify the PSD limit for U-NII devices operating in the 5725-5825 MHz band from 1 Watt in 20 MHz (50 mW/MHz) to 1 Watt in 2 MHz, or 500 mW/MHz. This change not only will ensure that U-NII devices are able to provide communications to those who are bypassed by other technologies, but also will create some degree of technological and distance-reaching parity between U-NII devices and spread spectrum devices at benchmark T1 data rates.

In addition, the Commission should modify the PSD limit for U-NII devices operating in the 5250-5350 MHz band from 0.250 Watts in 20 MHz (12.5 mW/MHz) to 0.250 Watts in 2 MHz, or 125 mW/MHz.

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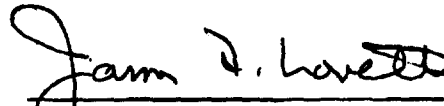
<sup>13</sup> Unlike U-NII devices, frequency hopping spread spectrum devices are subject to no limits on minimum bandwidth or maximum PSD; for example, a frequency hopping device that can convey T1-rate data in 1 MHz can utilize a PSD of 1 Watt/MHz (1000 mW/MHz), 13 dB greater than (or 20 times) the PSD limit for a U-NII device operating in the upper U-NII sub-band and 80 times the PSD limit for a U-NII device operating in the middle U-NII sub-band. Frequency hopping devices offering still lower data rates and bandwidths can utilize even higher PSDs. For example, to convey the rates achieved by new-generation telephone modems, 56 kbps, a frequency hopping systems could use an on-channel RF bandwidth of 100 kHz; and the PSD could then be 10 Watts/MHz. Direct sequence spread spectrum systems also have an advantage over U-NII systems in this regard: for example, a direct sequence system conveying a 2 MHz data channel with a processing gain of 10 dB can offer a signal-to-noise ratio (after de-spreading) equivalent to that provided by a signal utilizing a PSD of 500 mW/MHz, 10 dB greater than (or 10 times) the PSD limit for a U-NII device operating in the upper U-NII sub-band and 40 times the PSD limit for a U-NII device operating in the middle U-NII sub-band.

## CONCLUSION

For the reasons stated herein, Apple respectfully requests that the FCC promptly consider whether to permit the use of more highly directional antennas by U-NII devices operating in the middle and upper U-NII sub-bands, and amend the peak PSD limits for U-NII devices operating in these sub-bands.

Respectfully submitted,

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